

## Remarks/Arguments

### **Rejection Under 35 U.S.C 102(b) and 103(a)**

Claims 1-9 and 26-30 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over: 1) US Patent 4,492,682 (Trebillon); and 2 US Patent 5,480,587 (Musselman et al.).

Applicants traverse.

#### i) anticipation under 35 U.S.C. 102(b) by Trebillon or Musselman

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). (emphasis added) Furthermore, "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Applicants' Claim 1 covers an oxalic-modified aluminum hydroxide material having a chemical structure consisting essentially of aluminum hydroxide ( $\text{Al}(\text{OH})_3$ ) and oxalic acid moiety. Applicants' claim covers a material with a molecular structure that includes the oxalic moiety, which clearly distinguishes the material from the prior art. Applicants' claims can only be anticipated if each and every element is found, either expressly or inherently, in Trebillon or Musselman. As Applicants have previously argued, the two reference neither expressly nor inherently teach a molecular structure that includes the oxalic moiety.

#### a. Applicants' claimed invention

In Applicants' claimed invention, the chemical structure of the material consists essentially of aluminum hydroxide and oxalic acid moiety. As pointed out in Applicants response dated October 2, 2006, the material of the present invention has unique physical (and chemical) properties that clearly distinguish the materials of the prior art references.

First, the claimed material has a unique crystalline pattern X-ray that has a diffraction spectrum that has not been found in any other known crystalline pattern. There are differences

between the XRD pattern of the oxalic-modified aluminum hydroxide (shown in Figures 1A and 1B) and the XRD pattern of known aluminum hydroxide crystals. Applicants presented a Declaration filed under 37 CFR 1.132, in which the XRD patterns for three known kinds of aluminum hydroxide crystals -- gibbsite, nordstrandite and bayerite, were shown. The Applicants state in the Declaration their belief that these XRD patterns do not match and are different from the XRD of the claimed oxalic-modified aluminum hydroxide shown in Figure 1 of the present application. Consequently, Applicants believe that the claimed oxalic-modified aluminum hydroxide material is novel over these standard aluminum hydroxide crystals.

Second, Applicants note that the chemical structure of the oxalic-modified aluminum hydroxide material has an FTIR spectrum, shown in Fig. 3, having a strong peak at 1713.9, which corresponds to the characteristic carboxy peak at 1730, known to exist for an FTIR spectrum of oxalic acid alone. In the aforementioned Declaration, the Applicants presented spectra for oxalic acid in both anhydrous and hydrated forms, for formic acid, and for aluminum hydroxide (ATH). Applicants pointed out that the presence of other groups on the oxalic-based compound, and of other compounds in a composition containing oxalic acid, can cause a slight shifting in the carboxyl peak. Applicants further pointed out that ATH does not have a carboxyl peak whatsoever, while the claimed oxalic-modified aluminum hydroxide material has a carboxyl peak. The Applicants stated their belief in the Declaration that the peak at 1713 of the oxalic-modified aluminum hydroxide material is caused by the presence of oxalic acid moiety.

Third, Applicants stated in the Declaration that the Thermal Analysis (TA) of the oxalic-modified aluminum hydroxide material has a single peak at about 400°C, as shown in Figure 2. In contrast, an aluminum hydroxide (ATH) material that has oxalic acid in a physical mixture (not chemically structured with the ATH) with aluminum hydroxide (ATH) shows a pair of thermal peaks for oxalic acid (a first peak at about 115°C when oxalic acid changes to anhydride due to loss of bound water, and a second peak at about 202°C, when the oxalic anhydride decomposes), and one additional peak at about 302°C when the ATH decomposes. The Applicants stated in the 132 Declaration their belief that the oxalic-modified aluminum hydroxide has a chemically bonded structure consisting of aluminum hydroxide and the oxalic acid moiety. This structure is clearly different from that of the ATH with physically-mixed oxalic acid.

b) Trebillon '682

Trebillon describes without any uncertainty that making of boehmite or pseudo-boehmite. These materials are not known to chemically contain an oxalic acid moiety. Trebillon mentions often that the resulting crystal products appear to have the characteristic X-ray diffraction pattern of boehmite or pseudo-boehmite. There seems to be no accounting in Trebillon for the organic or inorganic acids or bases used as treatment agent (acetic, nitric, ammonia, ammonium acetate, hydrochloric, etc) or their anions. Trebillon expressly states “(f)rom the chemical point of view, the boehmites and pseudo-boehmites obtained by the process of the invention have a molar ratio of  $H_2O/Al_2O_3$  ranging from 1 to 2, which corresponds to all pseudo-boehmites structures... and boehmite structures...” See col 6 lines 60-65. The clear, express teaching of Trebillon is that the pseudo-boehmites structures and boehmite structures do not include oxalic moiety.

Therefore, the rejection fails to establish an anticipation of the material claims by the Trebillon reference.

c) Musselman et al. '587

Musselman et al. describes an ATH in which the water of hydration is removed and a substituent material is substituted into the site vacated by the water of hydration. The reference teaches that the method suppresses the vapor pressure of the substituent, stabilizing it to a temperature greater than 100 °C above its evaporation temperature (col 6 lines 1-9). Musselman et al. exemplify a glycol-treated ATH. The water of hydration in aluminum trihydrate is first driven off at 300 °C. Then, the dried material is added to boiling glycol (about 197 °C), filtered and dried. The glycol replaces the water of hydration to modify the exothermal properties of the product. The description and Figures referred to by the Examiner in the Action appear to all relate to the glycol treated material.

Mussleman shows in Figure 5 the Differential Scanning Calorimetry for ordinary hydrated ATH (the solid line) and for the glycol modified ATH (the dashed line). It is clear that the glycol is being chemically evaporated from the modified ATH, over a wide temperature range. This physical association with the substituent glycol is different from the structural modifications of Applicants' claimed material.

Musselman et al. state that substitutions for the water of hydration include a larger number of inorganic salt solutions, organics, and organic acids, one of which is oxalic. Mussleman et al. does not disclose a particular method of introducing the oxalic acid or any of the other acids or salts into the void in place of the water of hydration. The only method taught by Mussleman is to add the dehydrated ATH to boiling glycol. Applicants believe that a person of ordinary skill would consider that the process of substituting glycol with any of the acids or bases, let alone an oxalic acid solution, would not be an obvious variant of the process taught by Mussleman. Rather, Applicants believe that the concentration, temperature and other conditions of the oxalic acid solution that one of ordinary skill might use to effect to objective of Musselman, might be very different from those conditions selected by Applicants.

Musselman et al. also make no express or implied suggest of reacting the substituent with the aluminum hydroxide to structurally form an oxalic-modified structure of ATH, as expressly provided by the Applicants' claimed invention. Thus, a person of ordinary skill would not be motivated to modify an process of Musselman to achieve the objective disclosed by Applicant.

Further, Applicants presume that, when the substituent glycol is placed into the void left by water of hydration, the structure of the ATH is not molecularly modified. Consequently, a person of ordinary skill in the art would expect the thermal decomposition properties of a material made according to Musselman et al. would be different from those thermal decomposition properties shown for the oxalic-modified material of the claimed invention.

Therefore, the rejection fails to establish an anticipation of the material claims by the Mussleman et al. reference.

i) obviousness under 35 U.S.C. 103(a) over Trebillon or Mussleman

In the rejection, the Examiner rejects the claims in the alternative over the disclosure of either Trebillon or Musselman. The rejection states that the Trebillon reference (sic "applicant's claims") differ from Applicants' claimed invention in that it is unclear if the materials disclosed by the prior art actually meets applicants' claimed diffraction peaks by XRA spectrum at the locations of the listed D values and  $2\theta$  angles, since the references do not disclose XRA spectrum. The rejection further states that the references do not make a direct teaching to actually making or using an ultrafine oxalic-modified  $\text{Al}(\text{OH})_3$ . Nevertheless, the rejection concludes, the claims are deemed

obvious over the references because the references teach the same basic method of making ultrafine modified  $\text{Al}(\text{OH})_3$  with oxalic acid or salt, to produce ultrafine oxalic-modified  $\text{Al}(\text{OH})_3$ .

Applicants traverse.

In effect, the rejection appears to find the claims obvious because the process used by applicants and the process of the references are “basically the same” and “produce” the same resulting material. These conclusions appear to be clearly refuted by the disclosures of the Trebillon and Mussleman references themselves, and the evidence presented by Applicants.

a) Trebillon '682

Trebillon teaches a first step of mixing a strong or weak acid, or a weak base, with amorphous aluminum hydroxycarbonate, and subjecting the solution to a first heat treatment step of not more than 90°C. Trebillon describes that the anions contributed by the acids and bases, at the reaction temperature, permit a partial exchange of the anion for the carbonate anion of the amorphous aluminum hydroxycarbonate (col 3 lines 26-33). Trebillon teaches a second step wherein the reaction mixture of the first step is heated at a temperature below 90 °C for a period of at least 5 minutes (col 4 lines 8-11). Trebillon explains the criticality of this temperature to effect a partial exchange between the anion introduced via the acid or salt, and the carbonate anion. (col 4 lines 12-23). In a third step, the reaction solution of step 2 is heated to between 90-250 °C, which results in a crystallization of boehmite or pseudo-boehmite crystals out of the medium (col 3 line 65 through col 4 line 31). The boehmite crystals are then dried and calcinated.

With all due respect, the process of Trebillon and Applicants' process are not the “basically the same”. The steps, conditions, and objectives of the steps taught by Trebillon are markedly different from Applicants' process steps. As just one example, the Applicants' method includes the step of reacting the oxalic compound at a temperature of 100 °C and more. Applicants believe that a person of ordinary skill, understanding the differences in these two processes, would not expect the resulting products or their properties to be the same. As Applicants have demonstrated in their 132 Declaration, the result products are clearly not equivalent, or even similar.

Finally, while Trebillon discloses that the acid can be selected from a group of numerous acids that does include oxalic acid, Trebillon does not disclose or suggest that any of these acids might chemically combine with ATH to form the modified aluminum hydroxide material of

Applicants' claimed material. Trebillon also does not disclose or give any direction that points to or suggests any particular advantage or benefit of using, or the criticality of choosing, oxalic acid as a solution acid.

b) Musselman et al. '587

Musselman et al. describes a process and a resulting material that is a physical admixture of ATH and a substituent, such as ethylene glycol, which provides little more than suppressing of the volatilization of the substituent. The process starts with pre-formed hydrated ATH. A physical exchange of the water of hydration from the hydrated ATH is made with the substituent. Musselman appears to describe a step where the water of hydration of the hydrated ATH is "driven off", and a subsequent step of "driving in" the boiling substituent into the void space left by the water of hydration. As discussed above, the Differential Scanning Calorimetry of the resulting Musselman material is very different from hydrated ATH, and very different from that of Applicants' oxalic-modified  $\text{Al}(\text{OH})_3$  as shown in Fig. 3. A person of ordinary skill would not find it obvious to modify the process of Musselman et al. in any way to achieve a product having the distinctive properties demonstrated herein the Applicants.

Finally, while Musselman et al. mention that oxalic acid may be one of a large number of possible substituents for water of hydration, there is not disclosure or direction given that points to or suggests any particular advantage or benefit of using, or the criticality of choosing, oxalic acid as the substituent material. In the action, the Examiner states that Musselman discloses oxalic acid as "an effective organic material", however, that phrase does not appear in Musselman, and no such claim of efficacy can be found in Musselman.

c) Applicants' Declaration

At page 5 of the rejection, the Examiner emphasizes that Applicants' Declaration makes no direct comparison of the claimed material with the material taught by Trebillon and Musselman. There appears to be an implied requirement that Applicants reproduce the examples of the prior art. Applicants do not agree, particularly in the case, as here, where the stated processes and resulting products of the prior art are described sufficiently clearly that a person of ordinary skill in the art

would understand them to be different in molecular structure and formula from Applicants' claimed material.

First, the Examiner has not made out a prima facie obviousness rejection, since the references on their face teach materials and processes for their making which differ from Applicants' material.

Trebillon clearly states that the resulting compounds are boehmites and pseudo-boehmites, materials that do not have oxalic moieties in the structures. Even for the sake of argument, if Trebillon used an oxalic acid in its first step (where its anion effects a partial exchange with the carbonate anion of the amorphous aluminum hydroxycarbonate), Trebillon appears to teach clearly that the resulting product would not include an oxalic moiety.

Musselman et al. clearly teaches that the substituent is not chemically bound to the dehydrated ATH – rather the substituent is physically restrained in the void where water of hydration had been held. Retaining the substituent (glycol) in the void suppresses its evaporation. This is reflected in the DSC results in Mussleman. These features are clearly different from Applicants' disclosed process and claimed material.

Consequently, there is no justification to require a comparison of the claimed material with materials of the prior art, since such is both burdensome and unnecessary.

Even if, for the sake of argument, a prima facie obviousness rejection is made, Applicants have presented sufficient evidence to overcome such rejection. Applicants' inclusion of the XRD data in the claims clearly identifies Applicants' compound. Applicants have stated in the 132 Declaration that the XRD of Applicants' oxalic-modified aluminum hydroxide material shown in Figure 1 is different from those of the commercially available aluminum hydroxide crystals, and that the claimed XRD pattern was not found in an XRD figure library. Applicants' assert that the difference in the chemical structure of the claimed oxalic-modified materials presumes differences with the boehmite and pseudo-boehmites of Trebillon, which are expressly of different chemical structure.

As for Mussleman, it appears that commercially available ATH is used in the process. Musselman does not teach or suggest that the molecular structure of Musselman has been modified in the process. However, Mussleman discusses removing the water of hydration and filling the void

with the substituent. This appears to be a clear teaching to one of ordinary skill that the structure of Musselman (a commercially available ATH) is unchanged.

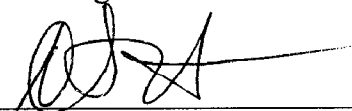
The proof, which the Examiner seeks, that the chemical structure of materials made in Trebillon and Mussleman are different from that of Applicants' molecular structure, therefore appears to be well established in the disclosures of the Trebillon and Mussleman references themselves.

This is believed to represent a complete response to the Office Action. Reconsideration and withdrawal of the rejections, and an early allowance, are respectfully requested.

Applicants reserve the opportunity to have the withdrawn method claims rejoined so that appropriate method claims amendments can be made to include the limitations made to the material claims.

Respectfully submitted,

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